Managed Care Heart Failure Project

Evaluation Report

Medicaid

Medical Review of North Carolina, Inc.

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EXECUTIVE SUMMARY

BACKGROUND: Heart failure (HF) is a condition that effects over five million Americans, the majority of which are elderly. The condition is associated with substantial disability, morbidity and hospitalizations. The rehospitalization rate is particularly high for this patient population. There is a broad consensus on appropriate treatment for HF patients to reduce morbidity and mortality.

METHODOLOGY: A healthcare quality improvement project was conducted with Medicaid managed care organizations focusing on improving process of care indicators, quality indicators, that are supported by evidence to be associated with improved clinical outcomes. The quality indicators chosen for the project include: 1) proportion of HF patients with assessment of left ventricular function (LVF), 2) proportion of HF patients with left ventricular systolic dysfunction (LVSD) who are prescribed an Angiotensin Converting Enzyme Inhibitor (ACE-I) or have a documented reason for not being prescribed an ACE-I, and 3) proportion of HF patients with LVSD who are prescribed a beta-adrenergic receptor blocking agent (βB) or have a documented reason for not being prescribed a βB. The data collection was conducted on-site at physician offices through medical record review. Cases were identified by the collaborating managed care organizations through claims data. Patients had a diagnosis of heart failure on one inpatient encounter or three outpatient encounters during the baseline study year 2000 and the evaluation study year July 1, 2001 through June 30, 2002. The design was pre-test/post-test; project success is measured by improvement over baseline performance, following an intervention period, of the project quality indicators. The intervention consisted of patient education brochures mailed to beneficiaries, guideline summaries and patient specific chart reminders delivered or mailed to physician offices and a baseline performance feedback report.

RESULTS: The table displays aggregate baseline and follow-up (evaluation) results for the project quality indicators. Complete information is provided in the body of the report. Quality indicators related to assessment of LVF and use of ACE-I demonstrated high quality at baseline that was sustained (Table). Substantial quality improvement was demonstrated regarding use of beta-blockers (Table).

CONCLUSION: Quality of HF care can be improved in managed care settings through focused efforts including patient activation and practice support. Continued efforts may be necessary to optimize use of beta-blockers.

QUALITY INDICATORS	CA* 1		CA* 2		MEDICAID	
	Baseline	Evaluation	Baseline	Evaluation	Baseline	Evaluation
LVF Testing	88%	92%	93%	93%	89%	92%
ACE-I Use**	85%	83%	89%	87%	86%	85%
Beta Blocker Use**	61%	83%	61%	74%	61%	79%

* CA - Carolina Access

** LVSD Patients

I. Introduction

Quality Improvement Organizations (QIOs), formerly known as Peer Review Organizations (PROs) strive to improve the processes and outcomes of healthcare. To achieve this goal, QIOs have conducted cooperative projects since 1994 as part of the Health Care Quality Improvement Program established by the Centers for Medicare & Medicaid Services (CMS) formerly the Health Care Financing Administration (HCFA).[1] Cooperative projects consist of collaborative efforts between QIOs and participating health care providers to improve the quality of healthcare provided to Medicare beneficiaries. Projects rely on criteria called quality indicators, or measurable aspects of care, which are supported by practice guidelines and/or a consensus of respected health care professionals.

In 1998 CMS established six clinical priority areas as a focus of improvement for all QIOs. The goal was to improve care for Medicare patients on a nationwide basis under the clinical topics of: Acute Myocardial Infarction, Breast Cancer, Diabetes, Heart Failure, Pneumonia and Stroke.[2]

"In June, 1998, the CMS implemented the Medicare+Choice program (Part C of Title XVIII of the Social Security Act) as established by the Balanced Budget Act (BBA) of 1997 (P.L. 105-33). Contained in the BBA legislation was quality assurance and performance improvement (QAPI) requirements for Medicare+Choice Organizations (M+C Organizations). M+C Organizations must operate an internal program of quality assessment and performance improvement that achieves significant improvements sustained over time in enrollee health, functional status and satisfaction across a wide range of care and services. M+C Organizations have considerable freedom to select focus areas addressing specific health care and service needs of their populations. The M+C Organizations must collect and report data reflecting performance on standardized measures of health outcomes and enrollee satisfaction as appropriate, and meet such minimum performance levels on these measures as may be established under its contract with CMS or States (for Medicaid). The M+C Organizations must also demonstrate compliance with basic requirements for administrative structures and processes that promote quality of care and beneficiary protection."[3]

M+C Organizations are required by contract to complete two QAPI projects per year. One project must be on a topic chosen by CMS, referred to as the national project, while the other project may be one of each organization's own choosing.[3] The CMS national project for 2000 is Heart Failure.[4] This is a report of the collaborative effort between Medical Review of North Carolina, Inc. (MRNC) and the Medicaid managed care organizations in fulfillment of the QAPI national project 2000 requirements.

Initial data abstracted for this project are referred to as "baseline". Upon receipt of baseline feedback reports, collaborating organizations developed improvement plans designed to improve the quality of care delivered to their members with heart failure. Following the implementation of the improvement plan, MRNC abstracted data from a new set of medical records from each plan. This report depicts baseline and evaluation data at the organization level and comparison information from all participating organizations, (hereafter referred to as Medicaid Aggregate).

There are four main sections to the report:

- The **background** section explains the rationale behind the project.
- The **methodology** section describes project quality indicators and the methods used to select the baseline sample and perform project data collection.
- The **results** section displays organization-specific data along with comparative data from all participating managed care organizations through a series of tables and bar charts.
- The **conclusions** summarize the project baseline and follow-up (evaluation) results.

Following this report, references cited in this document are listed. The Appendix contains the data collection instrument.

II. Background

Heat Failure (HF), recognized as a major public health problem in the United States,[5-8] is associated with substantial morbidity and mortality. It is a common condition that increases exponentially in occurrence with aging, exceeding a prevalence of 3% and an annual incidence of 1% in the elderly in both sexes.[7] Nearly 5,000,000 people in the United States have HF.[9] Incidence of new cases is roughly 550,000 per year and 260,000 patients die as a direct or indirect consequence of heart failure each year.[9] The occurrence of HF is reported to be increasing; hospital discharges for HF have increased from 377,000 in 1979 to 957,000 in 1997.[9] During the same period, death rates increased 128%.[9] As the size of the elderly population increases, the substantial morbidity and mortality currently attributable to HF will continue to increase.

HF is an important public health problem, in part, because survival following diagnosis is poor. Only 80% survived 3 months and 66% survived 1 year in one population-based series.[7] Survival was 65.3% and 31.0% at 1 and 5 years in a nationally representative series;[10] 5-year survival was 38% for women and 25% for men in the Framingham Study.[5] Although survival can be improved with utilization of effective therapy such as angiotensin converting enzyme inhibitor (ACE-I) and beta-adrenergic receptor blocking agents (βB), mortality remains substantial.[11-14] Readmission is common among survivors, occurring in almost half of patients with HF within 6 months of hospital discharge.[8] Quality of life is also impaired significantly by HF.[15,16]

The costs related to HF are substantial. HF is the single most frequent cause of hospitalization in the Medicare population; the estimated direct and indirect costs attributable to HF exceeded $22.5 billion in the United States in 1999.[9] In 1996, Medicare spent $3.6 billion on HF claims.[9] In NC, Medicare Part A claims data for 1998 identified HF as the third leading cause of hospitalization, with 18,419 hospitalizations. Mean length of stay was 5.7 days, inpatient mortality was 5.2% and the 30-day readmission rate was 22.5%.[17]

The most common cause of HF is an abnormality in left ventricular systolic dysfunction (LVSD) leading to an inadequate ejection of blood. Patients suspected of having HF should have left ventricular function evaluation to determine if heart failure is due to LVSD, defined as an ejection fraction of less than 40%.

The Clinical Practice Guideline released by the Agency for Health Care Policy and Research in 1994 remains the foundation for consensus among HF practitioners and is the algorithm employed by most disease management organizations.[18] A consensus indication for the wide use

of ACE-I in HF is central to the AHCPR guideline. Two recent updates of the guideline, published by the Heart Failure Society of America[19] and a pharmaceutical industry consortium known as ACTION-HF (Advisory Council To Improve Outcomes Nationwide in Heart Failure),[20] do not contradict the AHCPR guidelines but extend them based on recently available evidence regarding use of angiotensin II receptor blockers (ARBs), aldosterone antagonists, and βB's.

Beta blockers reduce morbidity and mortality in many HF patients. The MERIT-HF trial[21] was halted on October 31, 1998 when interim analysis showed a 34% reduction in mortality in patients with predominantly NYHA class II and III heart failure.[22] The benefit seen in all recent trials is seen in the presence of ACE-I or ARB. The use of carvedilol[14] and bisoprolol[23] is also supported in heart failure. Although NYHA Class IV patients did not unequivocally benefit from treatment in any of these published trials, preliminary and unpublished data suggest that the COPERNICUS trial, (stopped prematurely in March 2000) demonstrated a benefit of carvedilol use in the sickest HF patients.[24] A presentation at the 1999 American Heart Association meeting pointed out a potential limitation of beta-blockade therapy in HF; the BEST trial of bucindolol revealed no difference in outcomes in the population as a whole and suggested that black patients had a specific lack of benefit from treatment with this beta-blocker.[25]

III. Methodology

The project is designed to assess outpatient, primary care treatment of HF within Medicaid managed care in North Carolina. The unit of analysis is the managed care plan, however, targeted providers for quality improvement include all primary care providers (i.e., family practitioners, general practitioners, internists, cardiologists) treating Medicaid managed care enrollees with HF.

Study Population and Quality Indicators

Quality indicators are measurable aspects of care that are based on evidence and/or consensus, and linked to improved outcomes. The first two of the three quality indicators specified below are identical to those specified by CMS for the heart failure nationally mandated Quality Assurance/ Performance Improvement (QAPI) project.[4] CMS developed the left ventricular function assessment and ACE-I quality indicators based on guidelines recommended by 3 organizations: Agency for Health Care Policy and Research clinical practice guideline on heart failure,[18] American College of Cardiology/American Heart Association (ACC/AHA) Task Force Report,[26] and Heart Failure Society of America guidelines.[19] The indicators have been previously tested by CMS for feasibility of data collection in the outpatient setting, reliability, and acceptability of the measure to providers.

The third quality indicator specified below, which encourages use of βB, is not one promoted currently by CMS. However, the Heart Failure Working Group at the 1999 Scientific Forum on Quality of Care and Outcomes Research in Cardiovascular Disease and Stroke recommended measurement of βB utilization in the outpatient setting for patients with systolic dysfunction (NYHA classes I through III specifically).[27]

All three quality indicators for the project represent quantitative measures of performance on processes of care linked to improved health outcomes for a disease that dramatically affects Medicaid enrollees in both managed care and fee-for-service settings. The quality indicators were selected in order to meet a long-term objective of reducing morbidity and mortality associated with heart failure.

The NC Division of Medical Assistance- Managed Care Division identified the managed care plan's population of heart failure patients. Two independent samples were selected at baseline and evaluation. At baseline patients had to have been continuously enrolled in the plan for at least 180 days prior to and including December 31, 2000 and at evaluation, continuously enrolled for at least 180 days prior to and including June 30, 2002 **AND**

Have at least *one* of the following:

- discharge from an acute care hospital with a principal discharge diagnosis of heart failure (ICD-9-CM codes: 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, 428.x) during the designated measurement year; **OR**

- for those enrollees without a hospital principal discharge diagnosis of HF, three or more physician encounters with a diagnosis of heart failure (ICD-9-CM codes: 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, 428.x) during the designated measurement year.

  Exclusion criteria:

  Any documentation during the designated measurement year suggesting chronic renal dialysis, including any bill/encounter record/discharge record with one or more of the following codes: ICD-9-CM diagnosis codes V56.0, V56.8; ICD-9-CM procedure codes 39.95, 54.98; CPT codes 90935, 90937, 90940, 90945, 90947, 90989, 90993.

Designated Measurement Year: For medical record abstraction at baseline, information from calendar year 2000 was collected and for follow-up (evaluation) from November 1, 2001 – October 31, 2002.

Quality Indicator 1
Proportion of heart failure patients with assessment of left ventricular function.

Denominator:
Census or sample of population

Numerator:
Those in denominator with documentation that left ventricular function (LVF) has been evaluated any time before or during the designated measurement year.

Quality Indicator 2
Proportion of heart failure patients with left ventricular systolic dysfunction (LVSD) who:
1. **are prescribed angiotensin converting enzyme inhibitors (ACE-I); OR**
2. **have documented reason for not being prescribed ACE-I.**

Denominator:
Those in numerator of Quality Indicator 1 with ejection fraction less than 40%, or equivalent narrative description.

Numerator:
Those in denominator who have:

1. Been prescribed ACE-I at any time during the designated measurement year; **OR**

2. Any documentation of aortic stenosis or any coded diagnosis of aortic stenosis (ICD-9-CM codes 395.0, 395.2, 396.0, 396.2, 396.8, 424.1, 425.1, 747.22) anytime before or during the designated measurement year; **OR**

3. Any documentation of bilateral renal artery stenosis or any coded diagnosis of renal artery stenosis (ICD-9-CM code 440.1) anytime before or during the designated measurement year; **OR**

4. Any documented history of angioedema, hives, or severe rash with ACE-I use anytime before or during the designated measurement year; **OR**

5. Serum potassium >5.5 mg/dL on three or more occasions during the designated measurement year; **OR**

6. Serum creatinine >3.0 mg/dL on three or more occasions during the designated measurement year; **OR**

7. Systolic blood pressure less than 80 mm Hg on three or more occasions during the designated measurement year; **OR**

8. Any documentation of any specific reason why ACE-I not used (e.g., cough, hyperkalemia, hypotension, renal insufficiency/failure, other physician-noted reason) anytime before or during the designated measurement year; **OR**

9. Chart documentation of participation in a clinical trial testing alternatives to ACE-Is as first-line heart failure therapy during the designated measurement year.

Quality Indicator 3
Proportion of heart failure patients with left ventricular systolic dysfunction (LVSD) who:

1. **are prescribed a beta-adrenergic receptor blocking agent (βB) OR**
2. **have documented reason for not being prescribed (βB).**

(βB therapy should be routinely administered to clinically stable patients with LVSD and mild to moderate heart failure symptoms (NYHA class II-III) on standard therapy.)

Denominator:
Those in numerator of Quality Indicator 1 with LVSD minus exclusions.

Numerator:
Those in denominator who have:

1. Been prescribed a beta-blocker (βB) at any time during the designated measurement year; **OR**
2. Any documentation of the following:
   - allergy, adverse reaction or intolerance to βB
   - 2nd degree or 3rd degree AV block
   - severe bradycardia
   - symptomatic hypotension
   - asthma

Study Design

This quality improvement project provides collaborator specific and aggregate comparison baseline and follow-up (evaluation) data. Collaborating managed care plans were asked to develop a quality improvement plan based on the data provided in the baseline report. Subsequent to that report quality improvement interventions were carried out, a follow-up was then conducted.

Project Data Collection

Enrollees with HF were identified based on diagnostic codes entered into claims databases of participating managed care plans. Plans transmitted electronic files of patients meeting sampling criteria to MRNC for case selection. The primary source of data was the primary care provider's (as identified by the managed care plan) office-based medical record of the HF enrollee.

An abstraction tool for medical record review was developed to capture information on patient characteristics and care processes from outpatient medical records (see Appendix for medical record abstraction tool). To ensure tool validity, inpatient and outpatient abstraction tools that had been tested and utilized by CMS and other QIOs and advice from clinical experts were the basis of tool development. Abstracted medical record data was supplemented by claims data supplied by the managed care plans.

Registered Nurses, after receiving training on the medical record abstraction tool, collected information on-site at physician's offices from patient medical records. This information was then entered into an electronic data collection tool developed by MRNC. Standard data reliability testing was performed including intra- and inter-rater testing, to ensure the accuracy and consistency of the data collection. The extent to which abstractors agree with themselves at two different points in time is called intra-rater reliability. Inter-rater reliability refers to the degree to which two different abstractors agree with each other.

Analytic Methods

This study has a non-randomized design; hence, the evaluation focuses on comparisons before and after the intervention period. Sample size power calculations established a sample size of 400 cases/managed care organization with an oversample of 10% was performed at baseline and 20% oversample at follow-up. If the number of cases identified for any plan was less than or equal to the required sample size, then all cases were included in the study sample.

Analyses were conducted at both the managed care plan level and for all participating Medicaid managed care organizations (Medicaid Aggregate) using SAS®, a statistical software program.[28] All quality indicators are defined as proportions. Unless otherwise noted, the denominator used to calculate percentages is based on "N" (sample size) for the organization and for the aggregate. In some cases, missing values or exclusion criteria may change the denominator, making it smaller than "N". When this occurs, the new "n" will be indicated.

Description of Interventions

In addition to managed care organization specific improvement efforts, MRNC conducted targeted improvement interventions including performance audit and feedback at the managed care organization level and at a regional level for physicians. Information related to HF guidelines

and reminder tools were distributed to physicians. There was also a patient education/activation intervention. The interventions are described in detail below.

PERFORMANCE AUDIT AND FEEDBACK: This intervention consisted of the dissemination of feedback reports derived from baseline and follow-up (evaluation) medical record review highlighting the performance of the managed care plan, with comparison aggregate data from all plans participating in the project.

The number of cases included in the sample of records chosen for abstraction from any one particular physician office was too small for meaningful interpretation. Therefore, information from the medical record abstraction from all plans at baseline was combined and reported at the health service provider level (defined as particular contiguous counties) and distributed to those applicable physician members of the collaborating managed care plans.

GUIDELINE DISSEMINATION: Evidence exists indicating that simple dissemination of clinical practice guidelines does not appear to be an effective method of improving the application of the guideline. Combining the dissemination of guidelines with other intervention strategies may be more effective. Therefore, medical record reminder sheets were developed outlining recommended processes of care based on professional guidelines for the care of HF patients. These medical record reminder sheets were placed in the medical records of the cases selected for medical record abstraction for the baseline and follow-up data collection. For those patients not included in the baseline or follow-up sample population and for additional newly identified HF cases throughout the course of the project, personalized medical record reminder sheets were mailed to their assigned primary care physician. The physician was asked to insert the reminder sheet into the medical record of the patient. This sheet was not only a record of the care rendered but also a prompt to the physician regarding a recommended management approach for the patient.

MEDICAL RECORD REMINDERS: Reminders have been extensively and successfully used in the area of drug prescribing and preventive services. Even simple paper systems designed to remind the provider of the process of care that should be followed have been successful. During the baseline and follow-up medical record abstraction, a medical record reminder sticker was placed on all of the medical records of patients selected for medical record abstraction and others from the practice that were identified with HF but not selected for abstraction.

PATIENT ACTIVATION: This intervention consisted of developing and disseminating materials designed to increased patient demand for specific services. There is good evidence that messages from physicians and managed care organizations do result in increases in patient requests for preventive and other services. Therefore all patients identified with heart failure via claims data were mailed a patient educational brochure during the course of the project. The brochure may be used as a tool for the clinician for patient teaching, a patient self-education tool and/or a potential prompt for the physician to reinforce important information to the patient when the brochure is mentioned or brought into the office by the patient.

IV. Results – Tables & Graphs

Table 1

PATIENT DEMOGRAPHICS	CA* 1				CA* 2				MEDICAID			
	Baseline (N=432)		Evaluation (N=400)		Baseline (N=210)		Evaluation (N=214)		Baseline (N=642)		Evaluation (N=614)	
	N	%	N	%	N	%	N	%	N	%	N	%
Race												
African-American	168	38.9	139	34.8	120	57.1	123	57.5	288	44.9	262	42.7
Caucasian	219	50.7	233	58.3	82	39.1	78	36.5	301	46.9	311	50.7
Other	17	3.9	9	2.3	5	2.4	3	1.4	22	3.4	12	2.0
Unknown	28	6.5	19	4.8	3	1.4	10	4.7	31	4.8	29	4.7
Gender												
Male	132	30.6	119	29.8	59	28.1	58	27.1	191	29.8	177	28.8
Female	300	69.4	281	70.3	151	71.9	156	72.9	451	70.3	437	71.2
Age												
18-64	315	72.9	286	71.5	145	69.1	132	61.7	460	71.7	418	68.1
65-74	62	14.4	73	18.3	34	16.2	42	19.6	96	15.0	115	18.7
75-84	32	7.4	19	4.8	25	11.9	25	11.7	57	8.9	44	7.2
Over 85	23	5.3	22	5.5	6	2.9	15	7.0	29	4.5	37	6.0
Mean ± Std	59.3 ± 13.5		59.4 ± 12.9		58.8 ± 14.3		61.1 ± 15.0		59.2 ± 13.8		60.0 ± 13.7	

* CA - Carolina Access

Table 2

MEDICAL HISTORY	CA* 1				CA* 2				MEDICAID			
	Baseline (N=432)		Evaluation (N=400)		Baseline (N=210)		Evaluation (N=214)		Baseline (N=642)		Evaluation (N=614)	
	N	%	N	%	N	%	N	%	N	%	N	%
Coronary Artery Disease	262	60.7	213	53.3	109	51.9	106	49.5	371	57.8	319	52.0
Hypertension	338	78.2	332	83.0	158	75.2	178	83.2	496	77.3	510	83.1
Neuropathy	56	13.0	57	14.3	23	11.0	30	14.0	79	12.3	87	14.2
History of Diabetes	220	50.9	226	56.5	108	51.4	118	55.1	328	51.1	344	56.0
Current Smoker	137	31.7	118	29.5	62	29.5	54	25.2	199	31.0	172	28.0
Past Smoker	91	21.1	88	22.0	39	18.6	43	20.1	130	20.3	131	21.3

* CA - Carolina Access

Table 3

MEDICATIONS	CA* 1				CA* 2				MEDICAID			
	Baseline (N=432)		Evaluation (N=400)		Baseline (N=210)		Evaluation (N=214)		Baseline (N=642)		Evaluation (N=614)	
	N	%	N	%	N	%	N	%	N	%	N	%
ACE-Inhibitor	279	64.6	227	56.8	137	65.2	143	66.8	416	64.8	370	60.3
Angiotension-II Receptor Blocker (ARB)	43	10.0	54	13.5	23	11.0	28	13.1	66	10.3	82	13.4
Calcium Channel Blocker	134	31.0	119	29.8	79	37.6	70	32.7	213	33.2	189	30.8
Spironolactone	68	15.7	77	19.3	31	14.8	36	16.8	99	15.4	113	18.4
Digoxin	175	40.5	139	34.8	82	39.1	75	35.1	257	40.0	214	34.9
Diuretic	377	87.3	346	86.5	187	89.1	195	91.1	564	87.9	541	88.1
Hydralazine & Long-Acting Nitrates	14	3.2	14	3.5	7	3.3	6	2.8	21	3.3	20	3.3

* CA - Carolina Access

Table 4

QUALITY INDICATORS	CA* 1				CA* 2				MEDICAID			
	Baseline (N=432)		Evaluation (N=400)		Baseline (N=210)		Evaluation (N=214)		Baseline (N=642)		Evaluation (N=614)	
	N	%	N	%	N	%	N	%	N	%	N	%
Left Ventricular Function Assessment	378	87.5	367	91.8	195	92.9	200	93.5	573	89.3	567	92.4
LVSD Patients**	N=127		N=105		N=70		N=87		N=197		N=192	
ACE-Inhibitor Prescription or Intolerance/ Contraindication	108	85.0	87	82.9	62	88.6	76	87.4	170	86.3	163	84.9
Beta Blocker Prescription or Intolerance/ Contraindication	78	61.4	87	82.9	43	61.4	64	73.6	121	61.4	151	78.7

* CA - Carolina Access

** Classified as having LVSD if patient had an LVF < 40% or LVF description of: moderate, severe/very severe/very low/poor, or systolic dysfunction

Figure 1: Left Ventricular Function Assessment

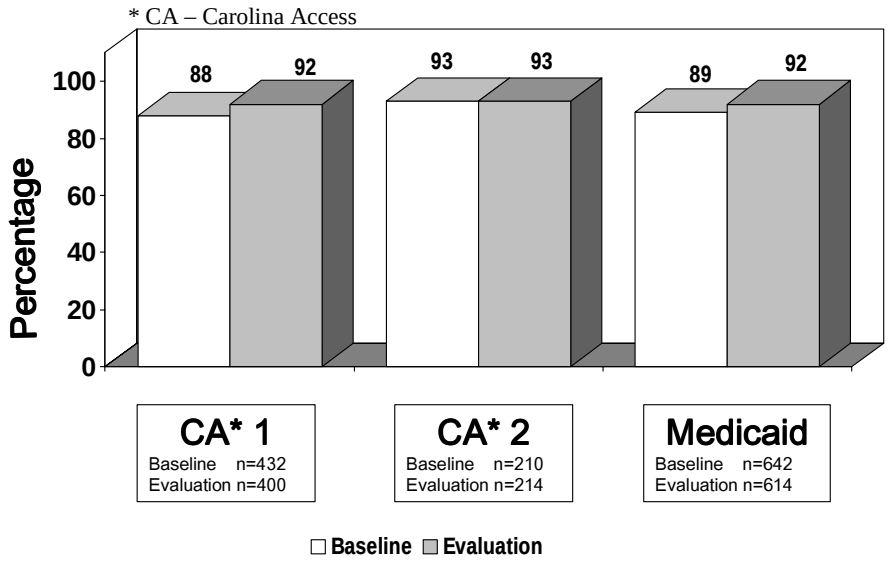

Table 5

LVF ASSESSMENT	CA* 1				CA* 2				MEDICAID			
	Baseline		Evaluation		Baseline		Evaluation		Baseline		Evaluation	
	N	%	N	%	N	%	N	%	N	%	N	%
LVF (Numeric) Result**	N=314		N=303		N=126		N=162		N=440		N=465	
<40%	124	39.5	101	33.3	64	50.8	82	50.6	188	42.7	183	39.4
40-49%	56	17.8	43	14.2	24	19.1	22	13.6	80	18.2	65	14.0
>=50%	134	42.7	159	52.5	38	30.2	58	35.8	172	39.1	217	46.7
LVF Narrative Description***	N=47		N=39		N=54		N=30		N=101		N=69	
Normal/Good/ Satisfactory	27	57.5	24	61.5	32	59.3	21	70.0	59	58.4	45	65.2
Mild	3	6.4	1	2.6	2	3.7	1	3.3	5	5.0	2	2.9
Moderate	0	0.0	0	0.0	4	7.4	2	6.7	4	4.0	2	2.9
Severe/Very severe/ Very Low/Poor	3	6.4	3	7.7	1	1.9	2	6.7	4	4.0	5	7.3
Systolic Dysfunction	0	0.0	1	2.6	1	1.9	1	3.3	1	1.0	2	2.9
Diastolic Dysfunction	5	10.6	5	12.8	8	14.8	0	0.0	13	12.9	5	7.3
None of the Above	9	19.2	5	12.8	6	11.1	3	10.0	15	14.9	8	11.6
LVSD Patients with Numeric or Qualitative Assessment	N=352		N=337		N=174		N=189		N=526		N=526	
LVSD Patients****	127	36.1	105	31.2	70	40.2	87	46.0	197	37.5	192	36.5

* CA - Carolina Access

** For patients with LVF assessment. Excludes patients with no (missing) LVF result

*** Excludes patients with no LVF assessment or LVF assessment with a numeric LVF result in record

****Classified as having LVSD if patient had an LVF < 40% or LVF description of: moderate, severe/very severe/very low/poor, or systolic dysfunction

Figure 2: LVSD Patients and ACE-Inhibitors

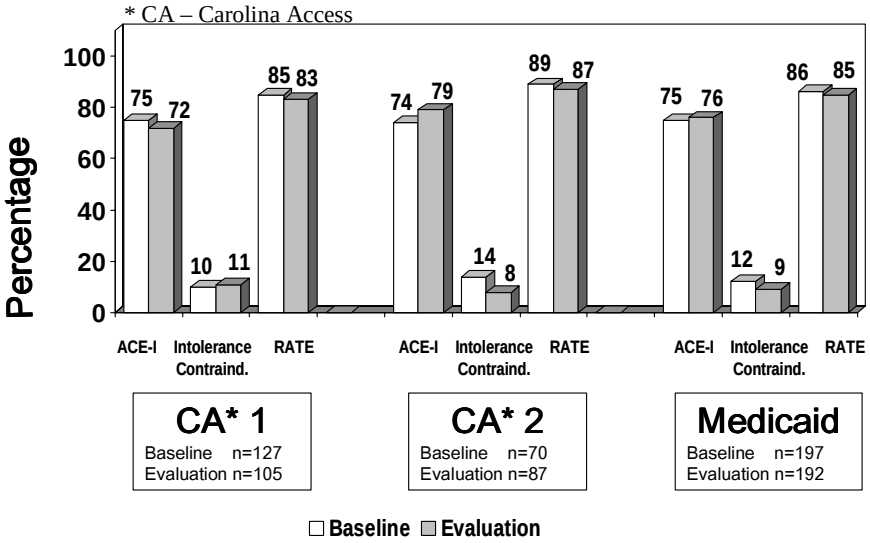

Figure 3: LVSD Patients and Beta Blockers

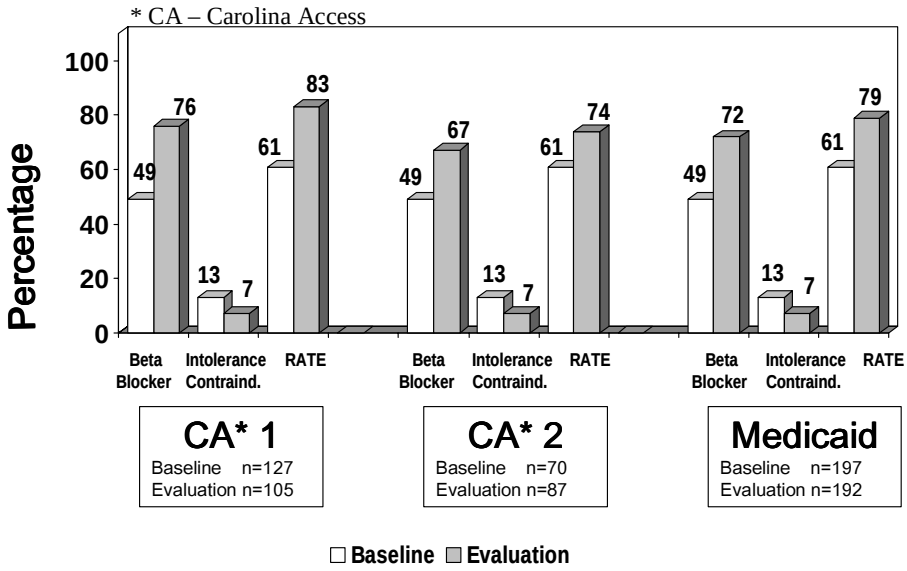

Table 6

MEDICATIONS FOR LVSD PATIENTS	CA* 1				CA* 2				MEDICAID			
	Baseline (N=127)		Evaluation (N=105)		Baseline (N=70)		Evaluation (N=87)		Baseline (N=197)		Evaluation (N=192)	
	N	%	N	%	N	%	N	%	N	%	N	%
Digoxin	91	71.7	60	57.1	47	67.1	48	55.2	138	70.1	108	56.3
Spironolactone	36	28.4	32	30.5	22	31.4	24	27.6	58	29.4	56	29.2
ACE-Inhibitors, or ARB, or Hydralazine & Long-Acting Nitrates	110	86.6	89	84.8	60	85.7	77	88.5	170	86.3	166	86.5
Diuretics	114	89.8	97	92.4	63	90.0	81	93.1	177	89.9	178	92.7
Calcium Channel Blocker	29	22.8	16	15.2	16	22.9	22	25.3	45	22.8	38	19.8
* CA - Carolina Access												

Table 7

ADDITIONAL ANALYSIS	CA* 1				CA* 2				MEDICAID			
	Baseline (N=432)		Evaluation (N=400)		Baseline (N=210)		Evaluation (N=214)		Baseline (N=642)		Evaluation (N=614)	
	N	%	N	%	N	%	N	%	N	%	N	%
Blood Pressure Measurement	431	99.8	398	99.5	209	99.5	211	98.6	640	99.7	609	99.2
Average Pulse Rate	79.8 ± 15.3		78.9 ± 12.9		79.2 ± 15.4		78.5 ± 13.8		79.6 ± 15.3		78.8 ± 13.2	
Blood Pressure**	n=430		n=394		n=209		n=211		n=639		n=605	
Below 140/90	276	64.2	252	64.0	113	54.1	126	59.7	389	60.9	378	62.5
* "CA" Carolina Access												
** Excludes patients with missing systolic or diastolic bp measure												

V. Conclusions

Quality indicators related to assessment of LVF and use of ACE inhibitors demonstrated high quality at baseline that was sustained. Substantial quality improvement was demonstrated regarding use of beta-blockers. Quality of HF care can be improved in managed care settings through focused efforts including patient activation and practice support. Continued efforts may be necessary to optimize use of beta-blockers and other effective agents.

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VII. Appendix

Abstraction Tool